In the claims:

Cancel claims 1-37.

Please add claims 38–58.

38. (New) A voltage regulator having an input terminal to be coupled to an input voltage source and an output terminal to be coupled to a load, the voltage regulator comprising:

a) a plurality of slaves coupled in parallel, each slave including:

i) a switching circuit to intermittently couple the input terminal and the output terminal in response to a digital control signal,

ii) a filter to provide a generally DC output voltage at the output terminal,

iii) a current sensor to generate a digital feedback signal representing the current passing through the switching circuit; and

b) a digital controller to receive and use the digital feedback signals from the plurality of slaves to generate a digital control signal for each slave, the digital controller configured to operate active slaves of the plurality of slaves at determined phase offsets to minimize voltage ripple and maintain the output voltage at the output terminal at a substantially constant level, the phase offsets representing time delays between the operation of each slave.

39. (New) The voltage regulator of claim 38, wherein the digital controller includes a digital control algorithm, the digital control algorithm configured to select a reference slave from the active slaves, and calculate a phase offset for each remaining non-reference slave of the active slaves.

40. (New) The voltage regulator of claim 39, wherein the digital control algorithm is configured to select a designated slave as the reference slave.

41. (New) The voltage regulator of claim 39, wherein the digital control algorithm is configured to rotate the selection of the reference slave through the plurality of slaves.

42. (New) The voltage regulator of claim 39, wherein digital control algorithm is configured to calculate a phase offset for each non-reference slave such that each of the active slaves are $(360°/n)$ degrees out of phase where n is the number of active slaves.

43. (New) The voltage regulator of claim 38, wherein the digital feedback signals from the plurality of slaves each indicate whether the current in a corresponding slave exceeds a threshold current.

44. (New) The voltage regulator of claim 43, wherein each of the current sensors from the plurality of slaves generates a plurality digital feedback signals, each signal representing whether the current in a corresponding slave has exceeded a different threshold current.

45. (New) The voltage regulator of claim 43, wherein each of the current sensors from the plurality of slaves generates a plurality digital feedback signals, each signal representing whether the current in a corresponding slave has crossed a different threshold current.

46. (New) The voltage regulator of claim 43, further comprising a fault protection circuit to override the digital control signal of a slave and open the switching circuit in the slave if the current passing through the switching circuit in the slave exceeds a safety limit, the safety limit being larger than the threshold current.

47. (New) The voltage regulator of claim 46, wherein the fault protection circuit generates a second digital feedback signal which is received by the digital controller if the current in a slave exceeds the safety limit.

48. (New) The voltage regulator of claim 43, wherein each of the switching circuits from the plurality of slaves includes a first transistor to couple the output terminal to the input terminal and a second transistor to couple the output terminal to ground.

49. (New) The voltage regulator of claim 48, wherein each of the current sensors from the plurality of slaves includes a first sensor to generate a first digital feedback signal on a first feedback line indicating the current passing through the first transistor in a corresponding slave and a second sensor to generate a second digital feedback signal on a second line representing the current passing through the second transistor in the corresponding slave.

50. (New) The voltage regulator of claim 49, wherein each of the first and second feedback lines in a corresponding slave are coupled to a third feedback line in the corresponding slave which is coupled to the digital controller, and the digital controller includes logic to determine which transistor in the corresponding slave is represented by the signal on the third feedback line.

51. (New) The voltage regulator of claim 48, wherein each slave further comprises an interpreter located on the slave which receives the digital control signal for the slave and converts the digital control signal into a command to switch the first and second transistors in the slave.

52. (New) The voltage regulator of claim 51, wherein the digital control signal generated by the digital controller for each slave includes a first control signal on a first control line and a second control signal on a second line, and the interpreter in a corresponding slave converts the first control signal into a command to open the first transistor and close the second transistor and converts the second control signal into a second command to close the first transistor and open the second transistor in the corresponding slave.

53. (New) The voltage regulator of claim 52, wherein the digital control signal generated by the digital controller for each slave includes a third control signal on a third control line, and the interpreter in a corresponding slave converts the third control signal into a command to open the first and second transistors in the corresponding slave.

54. (New) The voltage regulator of claim 53, wherein the interpreter in corresponding slave converts the third control signal into a command to open the first and second transistors if the second transistor is closed and the current falls below zero in the corresponding slave.

55. (New) The voltage regulator of claim 38, wherein the switching circuits, filters, and current sensors of the plurality of slaves are fabricated on a first IC chip, and the digital controller is fabricated on a second, separate IC chip.

56. (New) The voltage regulator of claim 38, further comprising a state sensor to generate a digital state signal indicating the state of the switching regulator which is received by the digital controller.

57. (New) The voltage regulator of claim 38, wherein the slave includes an interpreter which receives the digital control signal and converts the digital control signal into a command to switch the switching circuit.

58. (New) A method of operating a voltage regulator having an input terminal to be coupled to an input voltage source and an output terminal to be coupled to a load, the method comprising:

a) through each of a plurality of slaves coupled in parallel,

i) intermittently coupling the input terminal and the output terminal with a switching circuit in response to a digital control signal,

ii) filtering an output of the switching circuit to provide a generally DC output voltage at the output terminal,

iii) generating a digital feedback signal representing the current passing through the switching circuit with a current sensor; and

b) receiving and using the digital feedback signals from the plurality of slaves in a digital controller to generate a digital control signal for each slave, the digital controller configured to operate active slaves of the plurality of slaves at determined phase offsets to minimize voltage ripple and maintain the output voltage at the output terminal at a substantially constant level, the phase offsets representing time delays between the operation of each slave.